

REMARKS

Claims 1-11 are pending in the application. Claims 1-5 and 11 have been withdrawn from consideration as non-elected. Claims 6-10 were examined in the present Office Action and have been rejected. Applicant respectfully requests entry of newly added claims 12-17 introduced in this Amendment. Applicant thanks the Examiner for acknowledging Applicant's claim for foreign priority and receipt of the certified copy of the priority document. Applicant also thanks the Examiner for acceptance of the drawings filed July 26, 2001.

Claim Objections

Claims 6 and 7 are objected to as being indefinite. Applicant has amended these claims in a non-narrowing manner to more clearly define the method of the present invention. These amendments are thought to overcome the Examiner's objection.

Claim 9 is objected to under 37 C.F.R. § 1.75(c) as being in improper dependent form. The Examiner comments that it is unclear how claim 9 further limits claim 6, which already states that the second solution is applied from the nonprinting side of the fabric. Applicant respectfully submits that claim 9, in comparison to claim 6, includes the use of a "means [of] for applying". As such, these "means" are defined in accordance with §112, paragraph six, as the specifically disclosed structure and structural equivalents thereof. Thus, this limitation is proper and clearly defines a further characteristic of the invention. As such, Applicant respectfully requests that this objection be withdrawn.

Claim Rejections - 35 U.S.C. § 112

Claims 6 and 7 are rejected under 35 U.S.C. § 112, second paragraph as being indefinite. The Examiner comments that the claims are indefinite because it is unclear what the distinction between "synthetic fiber" and "fiber containing synthetic fiber" comprises. The Examiner asks whether Applicant intends the latter phrase to encompass blends of synthetic fibers and other fibers. Applicant respectfully submits that the answer to the Examiner's question is yes, and that such phrase is well understood by one of ordinary skill in the art on the basis of the teachings of the application. Thus, Applicant requests that this rejection be removed.

Claim Rejections - 35 U.S.C. § 102

Claims 6, 9 and 10 are rejected under 35 U.S.C. § 102(b) as being anticipated by Nakao et al (5,683,784). Applicant respectfully traverses this rejection for the following reasons.

The Invention

The method invention of claims 6-10 (and also newly added claims 12-17) concerns a method of preparing a fabric, both napped and unnapped, for use in an ink-jet printing operation. The fabric of interest comprises a synthetic fiber which inherently lacks desired ink absorbing characteristics. Thus, one problem is “white exposure” which is found in stretchable napped fabric (page 3, paragraph 0115). A further problem is “back staining” in which dye undesirably penetrates through the fabric (page 4, paragraph 0124). A variety of prior art approaches to solving these problems includes the application of an ink holding agent or layer to the fabric, as disclosed at page 2. However, these proposed solutions have not been successful.

The present invention solves these problems by applying to the fabric liquids having high wettability and low wettability in a specified sequence of steps. Wettability is a parameter related to a measure of interfacial interaction, such as surface tension, between the synthetic fiber and a liquid ink holding agent (page 7, paragraph 0153). Specifically, at least two types of solutions are applied to the fabric in two separate steps. One solution contains an ink holding agent of high wettability to the synthetic fiber and the other solution contains an ink holding agent of low wettability to the synthetic fiber. The ink holding agent of low wettability is applied to the fabric from its non-printing side, as outlined at page 8. The ink holding agent of high wettability is applied to the fabric so that the agent can cover the surface of each of the fiber yarns as illustrated in Fig. 2b. The ink holding agent of low wettability does not penetrate as well and is locally distributed near the non-printing side of the fabric, as illustrated in Fig. 2c, where the fabric 2 is coated with the high wettability agent 3 and the space is filled with the low wettability agent 4.

The application of the invention to a napped fabric, particularly with reference to Fig. 1(b) is explained beginning at page 10.

As explained at page 12, paragraph 0190, the preferred ink holding agents of high wettability comprise water-soluble polymers with specific examples given in paragraphs 0191-0193. The ink holding agents of low wettability are described at page 13 as polymer compounds which can form hydrogen bonds with the ink absorbed into them, most ideally gelling to build a network structure, like ones having amylose and cellulose as their main molecular chains. Specific examples are given at paragraphs 0196-0197 and also comprise natural and semi-synthetic polymers.

Nakao et al

The patent to Nakao et al concerns an ink-jet recording medium where a substrate made of fiber material may be coated with porous particles having a particle size from 0.1 to 30 microns and a surface layer made of bochmite as the main component. The porous particles have the effect of supplementing ink absorptivity during recording for fiber materials having low ink absorptivity, such as synthetic fibers. The porous particles also have the effect of preventing ink from passing through the substrate at the time of recording. The porous particles may be an inorganic or organic material such as silica, clay, etc., as described beginning at col. 1, line 66. The particles are present on at least one side of the fiber material and are coated onto the fiber material using a binder in a suitable solvent. A main component of the disclosed structure is the use of bochmite as the main component (col. 2, line 26), representing crystals having a formula $\text{Al}_2\text{O}_3 \cdot n\text{H}_2\text{O}$ ($n=1$ to 1.5) and a surface being cationic in order to ensure absorption of the dye. In the disclosed method, a coating liquid obtained by adding a binder to bochmite sol is coated by means of a roller, air knife, etc., followed by drying. A cationic resin layer may be formed beneath the bochmite surface layer to provide improved water resistance of the dye and may be formed only on one side. The cationic resin is a polyamide resin, as disclosed at col. 3, line 14 and is preferably hydrophobic. As explained at col. 3, line 41, the cationic resin layer is formed by coating the porous particles on the fiber material and then impregnating or coating a liquid having the cationic resin dissolved or disbursed in a suitable solvent. The sequence of coating, as disclosed at col. 3, line 57, may be before or after applying the coating of the porous particles.

However, Applicant submits that Nakao et al. is different from the present invention. In particular, the method of Nakao et al. does not take into consideration penetration into the fabric

as emphasized by the present invention and recited in claim 6. On the other hand, in the present invention as noted above, and as explained further using Fig 2, an ink holding agent of high wettability is applied to the fabric formed of the yarn so as to cover the surface of the yarn with the ink holding agent of high wettability. Then, the ink holding agent of low wettability is applied to the non-printing side of the fabric. As a result, at the non-printing side of the fabric, the ink holding agent of low wettability is filled in the yarn-to-yarn space which is covered with the ink holding agent of high wettability, thereby preventing "back staining". Accordingly, using the method of the present invention, the yarn can be dyed uniformly without ink-staining owing to the presence of the ink holding agent of high wettability, and a so-called imperfect penetration, and so forth do not occur. Further, "back staining" can be prevented owing to the presence of the ink holding agent of low wettability. In addition, the ink holding agent of high wettability and the ink holding agent of low wettability coexist on the non-printing side of the fabric, and as such, there is no concept of "layers" as disclosed in Nakao et al.

More specifically, for the Examiner's understanding of another advantage of the present invention, one other difference between Nakao et al. and the present invention is that in the Nakao et al. method, a substance which is applied to the surface upon completion of the ink jet printing remains on the final product (that is, the final product has a structure of "layer" + "fabric" + "layer"). On the other hand, in the present invention, the ink holding agent of high wettability and the ink holding agent of low wettability of the present invention merely temporarily hold ink which was subjected to ink-jet printing. As such, after the fiber is immersed with ink by wet-heat treatment after printing, the ink holding agent of high wettability and the ink holding agent of low wettability finish performing their functions, and are washed off in the next washing step (that is, the final product exists to have the structure of only "fabric").

Applicant submits that the present invention as recited differs from Nakao et al. because the bochmite may not be considered a high wettability agent. Indeed, the bochmite receives the ink, absorbs the dye and fixes it as an image. Such substance does not have the stated function of the claim, namely "to cause said solution to penetrate into the fabric." Instead, it acts to coat the porous particles to the fiber material. Similarly, Applicant submits that the cationic resin used in Nakao et al is not an "ink holding agent of low wettability" that penetrates into the fabric.

Indeed, the coating resin is preferably hydrophobic and, thus, would not hold ink. Moreover, it does not penetrate into the fabric.

Claims 6, 9 and 10 are rejected under 35 U.S.C. § 102(e) as being anticipated by Shimano et al (6,326,323). Applicant respectfully traverses this rejection for the following reasons.

Shimano et al

The Shimano et al patent teaches a fabric for ink-jet recording comprising a fibrous substrate and an ink absorbing layer formed thereon, which contains fine fibrous cellulose, a water-soluble non-ionic polymer, porous silica and a cationic polymer. All four types of components are required to form the ink absorbing layer. The fabric also has a resin layer opposite the ink absorbing layer (col. 3, line 21 - col. 4, line 26). The ink absorbing layer is applied as a blended resin composition liquid that is coated onto the fibrous substrate by a knife, or other coaters (col. 5, lines 29-37). The fibrous cellulose is a key ingredient to improving the water absorption and drying properties of the material.

The absorbing layer and resin layer are clearly different from the high and low wettable features recited in the claims. Specifically, Shimano does not teach a first solution containing an ink holding agent of high wettability and a second solution containing an ink holding agent of low wettability, both of which penetrate into the fabric. That is, like Nakao et al., Shimano et al. does not take into consideration penetration into the fabric as emphasized by the present invention and recited in the claims

The Examiner states that to be entitled to patentable weight in method claims, the recited structural limitations must effect the method in a manipulative sense and not to amount to the mere claiming of a use of a particular structure. The Examiner asserts that the features of the particular solutions do not materially affect the method steps of applying the solutions. Thus, the Examiner considers the claimed method as merely comprising applying a first solution to a fabric on one side and applying a second solution to the opposite side. However, Applicant respectfully submits that the Examiner is mistaken in this regard since (1) the claims are

specifically directed to the preparation of fabric for use in ink-jet printing and (2) the claims expressly require specific solutions in a sequence, and (3) the claims expressly require each solution to penetrate into the fabric. As such, the claimed method is specific to a particular desired result and that the solutions in the two references do not have the functions of the present invention.

Claim Rejections - 35 U.S.C. § 103

Claim 7 is rejected under 35 U.S.C. § 103(a) as being unpatentable over Nakao et al in view of Maeda et al (JP 09-279486). Applicant respectfully traverses this rejection for the following reasons.

The Examiner admits that Nakao does not teach a substrate which is a napped fabric. The Examiner looks to Maeda for a teaching of coating pile fabric to prepare it for ink-jet printing. The Examiner asserts that it would have been obvious to one of ordinary skill in the art to substitute a napped fabric for the fabrics of Nakao in order to produce an aesthetically pleasing fabric which can be ink-jet printed.

Applicant respectfully submits that claim 7 specifically requires first applying the ink holding agent of high wettability to the fiber to penetrate both the napped and ground textures. Thereafter, the ink holding agent of low wettability is applied to the non-printing side to penetrate into the ground texture. This particular sequence, for the materials and substances defined in the claim, is not seen in either cited reference (as discussed above for Nakao et al.). As such, Applicant submits that claim 7 is allowable.

Claim 7 is rejected under 35 U.S.C. § 103(a) as being unpatentable over Shimano in view of Maeda et al (JP 09-279486). Applicant traverses this rejection for at least the following reasons. First, Shimano does not teach the basic invention, as already described. Second, as explained with regard to the alternative rejection of claim 7, the combination of a specific sequence of steps of materials is not seen in the two references. As such, Applicant submits that claim 7 is allowable.

Claim 8 is rejected under 35 U.S.C. § 103(a) as being unpatentable over Nakao in view of Nakamura et al (EP 1 122 068).

The Examiner states that Nakao teaches the preferred application by knife coater or dipped coater and admits that padding a solution onto a fabric is not taught. However, the Examiner views such technique to be well known in the art and looks to Nakamura for such teaching, particularly at page 4, lines 16-17. However, Applicant submits that claim 8, as a dependent claim, is allowable at least on the basis of the distinctions made with regard to Nakao et al. as discussed above for claim 6. Nakamura et al does not remedy these deficiencies.

Claim 8 is rejected under 35 U.S.C. § 103(a) as being unpatentable over Shimano in view of Nakamura et al (EP 1 122 068).

The Examiner admits that Shimano does not teach padding a solution onto a fabric. However, the Examiner asserts that Nakamura's teaching of padding would be applicable to the invention of Shimano. Even, assuming arguendo, that the Examiner's position is correct, Nakamura et al does not remedy the deficiencies of Shimano and, thus, claim 8 is allowable

New Claims

Applicant has added new dependent claims 12-17 to further define the low and high wettability ink holding agents.

In view of the above, reconsideration and allowance of this application are now believed to be in order, and such actions are hereby soli cited. If any points remain in issue which the Examiner feels may be best resolved through a personal or telephone interview, the Examiner is kindly requested to contact the undersigned at the telephone number listed below.

The USPTO is directed and authorized to charge all required fees, except for the Issue Fee and the Publication Fee, to Deposit Account No. 19-4880. Please also credit any overpayments to said Deposit Account.

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